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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/659,136	09/10/2003	George Stojakovic	2003 P 50794 US	4805

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EXAMINER

DOLAN, JENNIFER M

ART UNIT PAPER NUMBER

2813

DATE MAILED: 03/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/659,136

**Applicant(s)**

STOJAKOVIC ET AL.

**Examiner**

Jennifer M. Dolan

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 1 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-58 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) \_\_\_\_ is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-58 are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 6-8, drawn to a magnetic tunnel junction device, classified in class 257, subclass 295.
  - II. Claims 1-5, drawn to a method for making an MTJ, wherein the sidewalls of a hard mask are oxidized, classified in class 438, subclass 696.
  - III. Claims 9-13, drawn to a method for making an MTJ including etching through a first thickness less than an entire thickness of a hardmask, classified in class 438, subclass 734.
  - IV. Claims 14-42, drawn to a method for making an MTJ including using an underlying structure, a TaN/Ti/TiN hardmask, and five separate etch chemistries for hardmask, MTJ, and underlying structure etches, classified in class 438, subclass 738.
  - V. Claims 43-58, drawn to a method for making an MTJ device including using oxygen and chlorine-based etch chemistries for etching through the MTJ stack, classified in class 438, subclass 742.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions (II, III, IV, or V) and I are related as processes of making and product made.

The inventions are distinct if either or both of the following can be shown: (1) that the process as

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claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product as claimed is an MTJ stack having a TaN/Ti/TiN layer thereon, which can be manufactured by simply depositing the metal layers on the MTJ stack, and does not require any specific hard mask oxidation, hard mask partial etching, or any specific etch chemistries for the mask or MTJ layers.

3. Inventions II, III, IV, and V are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable.

In the instant case, invention II has separate utility such as providing protection to a hard mask from being etched by the MTJ etchant. This feature would be usable with MTJ methods other than those defined in groups III, IV, or V, such as with MTJ methods having the hard mask fully etched in a single step, methods using hardmasks other than TaN/Ti/TiN, or methods using alternate MTJ etching methods, such as ion milling or  $\text{CO}+\text{NH}_3$  etches.

Similarly, invention III has separate utility of allowing for the removal of the photoresist before etching completely through the hardmask, and thus protecting the MTJ stack from photoresist stripping chemicals. This feature, however, is also usable for MTJ methods other than those defined in groups II, IV or V, such as for methods where the hardmask is not oxidized, methods using hardmasks other than TaN/Ti/TiN, or for methods using alternate MTJ etch chemistries.

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Invention IV has separate utility in that it teaches a preferred hardmask for patterning an MTJ stack as well as an underlying structure and specific separate etch steps, but it can be used independently of the other groups, which use either generic hardmask layers or specific etch chemistries not required for the practice of the group IV invention.

Invention V has separate utility in that it provides a preferred etch chemistry for etching an MTJ stack, but could be used with MTJ structures lacking a hardmask altogether. Although it is appreciated that the Applicant uses several of the features defined in Groups II-V in conjunction in various of the dependent claims, the claimed features such as the hardmask sidewall oxidation of Group II, the partial hardmask etching of Group III, the TaN/Ti/TiN hardmask and etching sequence of group IV, and the MTJ etchant of Group V all address different technical issues present in the prior art, with individual and independent benefits for each feature, and thus define separately patentable subject matter. See MPEP § 806.05(d).

4. Because these inventions are distinct for the reasons given above and the search required for each of Groups I-V, restriction for examination purposes as indicated is proper.

5. Applicant is advised that the reply to this requirement to be complete must include an election of the invention to be examined even though the requirement be traversed (37 CFR 1.143).

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the

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currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (571) 272-1690. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer M. Dolan  
Examiner  
Art Unit 2813

jmd

  
**ERIK KIEL**  
**PRIMARY EXAMINER**